HAZARD ANALYSIS FOR FERMILAB EMPLOYEES

INTRODUCTION

Hazard analysis is a process by which personnel can plan work as well as identify and mitigate the environmental, safety and health hazards involved in any work activity. This analysis helps to identify the specific work processes and materials necessary to safely complete a project, task, or work activity. This analysis also defines the roles and responsibilities of the workers involved in the task. This tool assures that activities in the work process are defined, understood, and anticipated by all those involved who actively participate. It also assures that hazards, either inherent in the activity or work environments, or resulting from the activity, have been identified and safely mitigated.

SCOPE

This policy applies to all Fermilab personnel, including visitors and temporary employees.

POLICY

All work activities performed by Fermilab employees shall be reviewed before the work is initiated to identify the environmental, safety and health hazards of the activity and the controls that are necessary to minimize the probability of an accident. There **may be occasions when a written hazard analysis is necessary** (i.e., complex jobs, unfamiliar hazards, high hazards, multiple organizations participating). **Table 1 provides guidelines to assist in making that determination.** Employees and supervisors are to use their professional judgment in determining the need for a written hazard analysis. The advice of the division/section Senior Safety Officer (SSO) or ES&H Section should be sought if assistance is needed.

An additional written hazard analysis is not required if the work activity is performed under a standard operating procedure or if the work activity involves the use of a permit where all the hazards and mitigation requirements are identified and

addressed. Examples of this could include lockout/tagout procedures, radiation work permit, confined space permit, excavation permit, and electrical work permit.

"Generic" hazard analyses may be used. Generic hazard analyses are those that would be routinely used for a specific activity (e.g., asbestos removal). They shall be reviewed by employees and updated as necessary prior to each specific activity to ensure all hazards are addressed.

Emergency repair activities may be required during off-shift hours. If a written hazard analysis for the work to be performed exists, it shall be reviewed and updated to incorporate field conditions. If a hazard analysis needs to be written, this can be done in the field. Verbal approval from the supervisor or designee may be sought in lieu of a signature. **Under no circumstances** shall an emergency serve as reason for ignoring established safe work practices.

RESPONSIBILITIES

Division/Section Heads are responsible for ensuring that this policy is implemented within their division/section.
Note: A division/section head may choose to impose more stringent requirements than those described in this policy. Additional requirements must be documented by internal procedures.

Supervisors and employees are responsible for performing a hazard analysis of their work activities and identifying those activities that require a written hazard analysis. Table 1 is a guideline in determining when a written hazard analysis is required. The supervisor is also responsible for:

- Ensuring that hazard analyses are developed and reviewed by the employee before work begins.
- Ensuring that employees are trained in the process of developing a hazard analysis.
- Seeking advice of the SSO or designee as appropriate.

Supervisors and employees will also perform the work in accordance with the hazard analysis.

Senior Safety Officers (SSO) or designee, are responsible for providing technical expertise in preparing or reviewing a hazard analysis when requested. SSOs are

responsible for performing periodic monitoring of work activities to verify adherence to this policy.

The ES&H Section will provide training support by developing a standard lesson plan for performing hazard analysis. The ES&H Section will also provide assistance in preparing and reviewing hazard analysis upon request.

PROCEDURE

1. The supervisor and employees identify work activities, the hazards associated with the activity, and the procedures and precautions that will be followed in performing the work.

2. If a written hazard analysis already exists, it must be reviewed prior to the start of work.
3. Using Table 1 as guidance, the supervisor and employees will decide if a written hazard analysis is to be prepared, and do so. Technical Appendix 2060-1 provides guidance in completing a written hazard analysis.

4. The hazard analysis will include or involve the following:

    - Detailed scope of work, including how the person/team intends to complete the work;
    - Walk down or inspection of the work area while planning the work;
    - Identification of hazards;
    - Identification of work requirements, controls, procedures, instructions and personal protective equipment necessary to perform the work safely (including permits); and
    - Involvement of the workers in the preparation of the hazard analysis.

5. The level of detail of the hazard analysis should be relative to the complexity of the work and the hazards involved with the activity. For instance, straightforward welding in an approved hood would require less detail than if one were welding in the Main Injector Tunnel while standing on a ladder. The attached form shall be used to document the hazard analysis and work planning.

6. The supervisor will review the hazard analysis for completeness and thoroughness and that the hazards for the work activity have been adequately identified and controlled. It is recommended that permits, Material safety Data Sheets, etc., be attached to the written hazard analysis (to the extent possible) to consolidate the work package. The supervisor will then approve the hazard analysis.

7. After the hazard analysis has been approved, the supervisor and employees performing the work shall review the hazard analysis to ensure everyone is aware of how the work will proceed. All who review the hazard analysis will document the review by signing the form. Only then will the supervisor allow the work to begin. The hazard analysis shall be posted in the work area or shall be readily available to those performing the work.

8. The work activity must be completed in accordance with the hazard analysis. If there is a change in the work scope, if work conditions change or new hazards are identified, or the controls prove inadequate or ineffective, the hazard analysis shall be reviewed by the employees and supervisor, revised as necessary, and approval/concurrence obtained before the work is continued.

9. After the activity has been completed, the hazard analysis should be updated to include improvements that were identified while performing the work.

10. The supervisor will keep a copy of the hazard analysis for training employees. A copy will be provided to the SSO for the purposes of providing oversight, trending and lessons learned.

11. In general, a written hazard analysis should be kept on file for 1 year.

Table 1 Potential Hazards Guideline*
These are guidelines for determining when a written-hazard analysis is necessary. They are intended to be used as guidance and not to limit sound professional judgment.

***If the work activity involves the use of a permit or standard operating procedure that completely addresses all the hazards of the job, an additional written hazard analysis is not necessary. Examples of this could include lockout/tagout procedures, Radiation Work Permit, confined space permit, excavation permit, and electrical hot work permit.**

Category	High-Level Hazard
Radiological Work	• When a Radiation Work Permit is required * (See FRCM Article 322) •
Electrical work	• Work activities near or on exposed electrical conductors, circuits, or equipment that are or may be energized and where there is a significant and unmitigated exposure to electrical shock or a significant potential for arcing, flash burns, electrical burns, or arc blast* (FESHM 5042)
Confined Space Work	• Permit required confined space entry* (FESHM 5063) where and when hazards cannot be adequately addressed in the permit
Crane & Hoist Usage	• Load requires exceptional care in handling because of size, shape, weight, close-tolerance installation, high susceptibility to damage, or other unusual factors • Load tests at 100% or 125% of rated capacity
Excavation and digging	• Digging or excavating in area where the potential exists for encountering buried utilities* (FESHM 7030) • Employees entering excavation/trench that is $\geq$ 4 feet in depth
Hazardous substances & regulated pollutants	• Potential for release of hazmat on-site in quantities > 50% of "Reportable Quantities" (40 CFR 302 and 40 CFR 355) • Potential for release of 42 gallons or more of petroleum, fuel oil, oil refuse, and oil mixed with wastes (FESHM 3050)
Chemical Usage	Use of materials that are flammable, combustible, corrosive, reactive, toxic, caustic, poisonous or any material that because of the quantity and/or manner it is being used is hazardous to the health of the worker
Respiratory and Hearing Protection	Work requiring hearing or respiratory protection due to exceedance of Permissible Exposure Limits (FESHM 5061 and 5103)
Hazardous Substance Abatement Activities	Work involving abatement of asbestos, lead, PCBs, or mercury
Cryogenic Systems	• Potential for exposure to reduced atmospheric oxygen

Category	High-Level Hazard
	• Working on cryogenic systems
Magnetic Fields	• Potential for exposure in excess of action limits established in FESHM 5062.5
Lasers	• Use of Class IIIB or IV lasers (FESHM 5062.1)
Working at heights	Fall potential is > 6 feet, and additional fall protection is required
Other	• Working with systems or equipment which are pressurized > 15 psig • Working with vacuum vessels (FESHM 5033) • Work requiring welding, brazing, or open flames* • Potential for inadvertent startup of equipment • Potential for unexpected release of energy (hydraulic, pneumatic, thermal, potential, etc.) where lockout/tag out is required. • Activating involving lower level hazard, but involve multiple organizations participating • Potential for job-induced alertness reduction (e.g., long hours, short deadlines) • Activities presenting lower hazards, but are performed infrequently • Activities presenting hazard unfamiliar to employees

HAZARD ANALYSIS

Using the format below, identify hazards and safety precautions/procedures to mitigate hazards. Use as many sheets as necessary.

Description of Work: _____
_____
_____
_____
_____

Step/Phase of Job	Safety Hazard	Precautions/Safety Procedures

Accepted: _____ **Date:** _____
Supervisor/Task Manager

My supervisor has reviewed this hazard analysis with me and I understand the hazards and required precautionary actions. I will follow the requirements of this hazard analysis or notify my supervisor if I am unable to do so.

Name (please print)	Signature	Date

General Guide in Performing Hazard Analysis

The Hazard Analysis:

When performed properly, a Hazard Analysis (HA) can be an effective management planning tool that not only describes how a job will be performed, but also identifies hazardous conditions and unsafe acts in the work place. A HA is intended to analyze the individual steps or activities, which together create a job or specific work duty, and detect any actual or potential hazards that may be present. It also increases employee involvement in the safety process and enhances communication between management and employees regarding safety concerns. The HA can identify less obvious potential hazards that may go undetected during routine management observations or audits. The HA is also an appropriate forum in which potential environmental hazards may be analyzed. This guide has been developed to assist employees in conducting a hazard analysis and how to complete the form when the decision is made to document the hazard analysis.

Procedure

STEP 1. Identify Jobs to Analyze

All work activities should undergo a hazard analysis process. But it is especially important for the following:

- Jobs in which workers have experienced the most accidents.

- Jobs in which workers have not yet experienced accidents, but have dangerous steps.

- New jobs.

- Current jobs for which new equipment or processes have been added or changed.

- Activities involving more than one organization.

STEP 2. Perform the Hazard Analysis

A. List the steps of the job/activity.

- Identify the steps (in order) of the work to be performed.
- Try to limit the number of steps to 6-8, it will get too confusing.
- Use action words, such as "turn on," "load," "steer," or "unload."
- Tell completely but briefly what is done in each step, such as "lift the load and back out." Do not tell how the step is done, "lift the load with the fork slightly raised and back out slowly."
- Be specific about the chemicals or equipment to be used.
- Continue in this way until you have listed every basic step in the job.

B. Identify the hazards associated with each step.

- Identify possible hazards and accidents for each step in the job.
- Define hazards as something that can happen to a human being, equipment, or environment. For example, use the term "cave-in" rather than "excavation". Excavation should be part of the steps of the job.
- Be sure to include hazards from the job itself, as well as hazards from the work area.
- *Ask yourself these questions:*
  - Is there danger of striking or being struck by an object?
  - Is there danger of being caught in, by, or between objects?
  - Is there a danger of slipping, tripping, or falling?
  - Can pushing, pulling, lifting, bending, or twisting cause strain?

- Will flammable material or hazardous chemicals be used?

- Is there danger of harm to eyes, hands, feet, or other parts of a worker's body?

- Is there potential for environmental impacts (e.g., air, soil, or water, release of toxic or harmful chemicals, unnecessary generation of waste)?

See <u>Appendix A</u> as a source of reference.

C. Make Safety Recommendations.

- For each hazard that you've identified, make a specific recommendation that will eliminate or reduce the hazard and reduce the chance of an accident.

<u>STEP 3. Document the Analysis as Appropriate</u>

- Fill out the spaces regarding the scope of work

- The first column provides space to list the basic steps of the job in the order in which they are performed.

- The middle column provides space to describe all hazards connected to each step in the first column.

- The last column provides space to suggest ways to eliminate or reduce the hazards in the middle column.

Pointers:

- Work Column #1 on the form first. From there, work each step of the job horizontally across the form. Identify the hazard and precautions for Step 1 before moving onto Step 2.

- Be specific. Do not use terms such as "proper PPE." Use terms such as "safety goggles", neoprene gloves, ", etc.

- The HA should identify the need for permits.

- If the work activity involves the use of a permit or standard operating procedure that completely addresses all the hazards of the job, an additional written hazard analysis is not necessary.

STEP 4. Review the Hazard Analysis with the Work Team

Check with team doing the work to be sure that:

- Steps are listed and in the correct order.

- Hazards have been identified.

- Safety recommendations are appropriate.

- Additional recommendations from employees are incorporated.

- Appropriate training for affected employees have been conducted (may need to check documentation).

- Employees understand and agree to follow HA.

- All the workers have signed hazard analysis.

STEP 5. Review/Revise the Hazard Analysis

- Whenever a task is changed, such as:
  - When new equipment is used
  - When a new way of doing a job is started
- Every 6 to 12 months if a task hasn't changed.
- When an accident takes place.
- Upon hiring / introducing new employees to the team, task, job, or project.

Appendix A
Things to Think About When Performing a Hazard Analysis

Environmental – Chemical

[] Does work involve corrosives?…oxidizers?…solvents?…irritants?…ODH atmosphere?… toxic gases/vapors/fumes?

Environment-Physical

Falling

[] Can the worker slip, trip, or fall to the same level? ...to a lower level?

Struck by or striking against

[] Can the worker be struck by moving or flying object? ... by falling material?

[] Can the worker strike against moving objects? ...against stationary object? …against jagged or sharp edges?

Caught in, on, or between

[] Can the worker be caught between pinch points? ...between two moving objects? ...on moving objects or machinery? ...on stationary protruding objects? ...in moving machinery? ...in an enclosure or opening?

Contact with energy sources or hazardous materials

[] Can the worker come in contact with extreme heat? …extreme cold? …electrical current? ...harmful gases or fumes? ...radiation? ...poor ventilation? …flammable material?

Overexertion

[] Can the worker be injured through exertion while lifting? ...pulling? …pushing? ...bending?

Fire/Explosion

[] Will flammable s/combustibles be used?…explosives?…welding/torch cutting?

Environment-Ergonomic

[] Can an inappropriate work environment injure the worker? ...inappropriate tools? ...poor lighting? ...repetitive motion or awkward positioning? ...poor tool design? ...poor workstation layout?

Environment-Biological

[] Can the worker come in contact with bacteria? ...viruses? ...fungi? ...parasites? …...contaminated water?

Employee Behavior-Work Practices

[] Is the worker wearing appropriate personal protective equipment? Are the most current procedures for doing the job being followed? Other: _____

Environmental Behavior-Work Practices

[] Is there a potential for an unplanned release of chemicals to the environment? …hazardous waste? …low level waste?

[] Will a substantial amount of waste be generated?

[] Is there a potential for chemical substitution?